IN THE APPLICATION

OF

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FOR

Oil Cooling System to Provide Enhanced Thermal Control for Combustion Engines

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to cooling systems for combustion engines and, more specifically, to an oil cooling system to provide enhanced thermal control for combustion engines utilizing an oil cooling system that will maintain the temperature of the oil that lubricates the engine components and will work in parallel with the traditional liquid cooling systems currently in use to prevent an engine from overheating even under extreme conditions.

Extreme heat conditions wreak havoc with combustion engines when the liquid coolant systems are unable to effectively maintain adequate thermal control of the engine because they only cool the cylinder head thereby resulting in overheating and possible engine damage. The oil lubricating the engine likewise increases in temperature as it passes through the heated components and serves to further transfer the heat to other related components thus contributing to the overheated condition rather than rectifying it. Furthermore, a high oil temperature greatly increases the rate of viscosity breakdown thereby

compromising the effectiveness of the lubricating properties of the oil which could lead to engine damage.

The present invention seeks to overcome the shortcomings of the prior art by introducing a means for maintaining the oil within the oil sump at a predetermined temperature range in order to act as a secondary coolant system working in parallel with the standard liquid coolant system to provide improved thermal control thereof. The cooled oil is returned to the sump rather than introduced to the engine so as to avoid a sudden temperature change therein which could lead to a very dangerous and expensive engine failure. The oil cooling system of the present invention serves to cool all of the engine components that the oil comes in contact with while the liquid cooling system cools only the cylinder head.

The oil pump of the present invention is constantly in operation as the engine is running and the thermo-reactive valve remains closed under normal thermal conditions thereby routing the oil through a bypass conduit and by-pass valve that returns the oil to the sump. This provides a continuous flow of oil from the sump in order to maintain physical contact with the temperature sensors

for accurate and immediate representation of the oil temperature being fed into the engine from the sump. The by-pass valve is always open during normal operating conditions to relieve pressure build-up since the pump is operating at all times even when the thermo-reactive valve is closed. It also prevents oil degradation from the high pressure and heat that would result therefrom. The by-pass valve closes during high temperature conditions to prevent pressure loss into the radiator due to oil traveling through the by-pass conduit.

The oil cooling system of the present invention is flexible and may be adapted to accommodate a plurality of applications according to the needs of the engine to be cooled and the environmental conditions under which it will be used. There are many variables that may be factored in when designing the specifications of the oil cooling system for a particular application such as the high limit settings of the temperature sensors, the size of the radiator and fan, the rate and amount of oil flow through the radiator as determined by the oil pump and conduit diameter.

The oil cooling system of the present invention may be manufactured into new engines or may be independent and retrofit to existing engines.

Description of the Prior Art

There are other cooling systems for combustion engines, while these cooling systems may be suitable for the purposes for which they were designed, they would not be as suitable for the purposes of the present invention, as hereinafter described.

SUMMARY OF THE PRESENT INVENTION

A primary object of the present invention is to provide an oil cooling system for combustion engines wherein an oil cooling system works in parallel with the liquid coolant system to maintain a lower core temperature in the engine when operated for extended periods in a heated environment.

Another object of the present invention is to provide an oil cooling system for combustion engines having a thermo-reactive valve that opens to provide passage to the oil cooling radiator when the oil temperature rises above a preselected point.

Still another object of the present invention is to provide an oil cooling system for combustion engines wherein the oil is removed from the oil sump by an oil pump where it is then cooled by the oil cooling radiator and a fan before being returned to the sump.

Yet another object of the present invention is to provide an oil cooling system for combustion engines wherein the thermo-reactive valve gradually closes as the oil temperature drops below a predetermined level.

Another object of the present invention is to provide an oil cooling system for combustion engines that will retard viscosity breakdown of the oil when used in an environment with extreme heat.

Yet another object of the present invention is to provide an oil cooling system having it's own oil filter thereby providing a secondary filter to work in parallel with the oil filter integrated with the standard lubrication system of the engine.

Still another object of the present invention is to provide an oil cooling system for combustion engines that is simple and easy to use.

Still yet another object of the present invention is to provide an oil cooling system for combustion engines that is inexpensive to manufacture and operate.

Additional objects of the present invention will appear as the description proceeds.

The foregoing and other objects and advantages will appear from the description to follow. In the description reference is made to the accompanying drawings, which forms a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments will be described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural changes may be made without departing from the scope of the invention. In the accompanying drawings, like reference characters designate the same or similar parts throughout the several views.

The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is best defined by the appended claims.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

In order that the invention may be more fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a schematic view of the present invention;

FIGURE 2 is a schematic view of the present invention during normal operating conditions;

FIGURE 3 is a schematic view of the present invention during high temperature operating conditions;

FIGURE 4 is a schematic view of the present invention and engine lubrication and liquid cooling systems during high temperature operating conditions;

FIGURE 5 is a schematic diagram of the electrical operation of the present invention;

FIGURE 6 is a detail view of the radiator of the present invention; and

FIGURE 7 is a detail view of the oil pump, the electrical heat switch and sensor, by-pass valve, thermo-reactive valve and oil filter of the present invention during a high temperature condition.

DESCRIPTION OF THE REFERENCED NUMERALS

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, the figures illustrate the Oil Cooling System for Combustion Engines of the present invention. With regard to the reference numerals used, the following numbering is used throughout the various drawing figures.

10	Oil Cooling System for Combustion Engines
12	engine
14	oil sump of 12
16	oil
18	oil pump
20	electric heat switch
22	temperature sensor of 20
24	thermo-reactive valve
26	thermo-static expansion valve
27	electric by-pass valve
28	oil filter
30	oil conduit

32 intake line

34 intake port

36 return line

37 counter-backflow loop of 36

38 outlet port

40 by-pass conduit

42 oil-cooling radiator

43 heat sinks of 42

44 oil lubrication circuit of 12

46 fan

48 power source

50 liquid coolant system of 12

52 strainer element

54 cylinder head

56 oil fill port

57 fill cap

58 oil drain

60 first electrical wire from positive terminal to electric heat switch

62 second electrical wire from electric heat switch to fan

64 third electrical wire from fan to negative terminal

66 fourth electrical wire from electric by-pass valve to 62

68 fifth electrical wire from electric by-pass valve to 64

70 negative terminal of 48

72 positive terminal of 48

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following discussion describes in detail one embodiment of the invention. This discussion should not be construed, however, as limiting the invention to those particular embodiments, practitioners skilled in the art will recognize numerous other embodiments as well. For definition of the complete scope of the invention, the reader is directed to appended claims.

FIGURE 1 is a perspective view of the present invention **10**. The present invention **10** is an oil cooling system **10** that serves to provide thermal control for combustion engines **12**. The present invention **10** includes an oil pump **18** that continuously draws oil **16** from the oil sump **14** of the engine **12** through an intake port **34** with a strainer element **52** that will prevent any particulate matter in the sump **14** from entering the oil cooling system **10** and returns the oil **16** to the sump **14** through a return line **36** which is the portion of the oil conduit **30** proximal the oil outlet port **38** which serves as the point of egress of the oil **16** back into the sump. The intake port **34** is disposed on the distal end of the intake conduit **32** which is the portion of the oil conduit **30** proximal the point of

entry of the oil **16** in the sump **14**. The conduit **30** of the return line **36** has a counter-backflow loop **37** with the peak portion thereof level with or higher than the highest point of said intake conduit **32** to prevent the oil **16** from draining back into the sump **14** from the radiator **42** when the engine **12** is turned off. The temperature sensor **22** of the electrical heat switch **20** monitors the temperature of the oil **16** during operation of the engine **12**. A thermo-reactive valve **24** such a thermo-static expansion valve **26** remains closed during normal operating conditions routing the oil **16** through a by-pass conduit **40** back to the sump **14** and responds accordingly to a high oil **16** temperature condition by gradually opening as the heat of the oil **16** increases thereby permitting the flow of oil **16** into the radiator **42**. An electrical by-pass valve **27** is in line with the by-pass conduit **40** and is always open until the thermo-reactive valve **24** is fully open whereupon the by-pass valve **27** closes and remains as such until the electric heat switch **20** opens the circuit. The oil **16** is diverted through an oil filter **28** to a radiator **42** cooled by a fan **46** that is activated by the temperature sensor **22** of the electrical heat switch **20** closing the circuit between the power source **48** and the fan **46** when a high temperature condition is detected and the by-pass valve **27** closes simultaneously. The DC power source **48** has a positive terminal **72** and a negative terminal **70**. The value of the high temperature

condition required to activate the electrical heat switch **20** should be equal to the temperature required to fully open the thermo-reactive valve **24**. The present invention **10** works in conjunction with the oil lubricating system **44** of the engine **12** and may be manufactured integral with new engines **12** or retrofit to existing ones. The electrical circuit includes a first electrical wire **60** from the positive terminal **72** of the power supply **48** to the electrical heat switch **20**, a second electrical wire **62** from the electrical heat switch **20** to the fan **46,** a third electrical wire **64** from the fan **46** to negative terminal **70**, a fourth electrical wire **66** from the electric by-pass valve **27** to the second electrical wire **62** and a fifth electrical wire **68** from by-pass valve **27** to the third electrical wire **64**.

FIGURE 2 is a schematic view of the present invention **10** during normal operating conditions. Shown is the present invention **10** in use with an operating engine **12**. The oil pump **18** is drawing oil **16** from the oil sump **14** and transporting it through the strainer element **52** in the intake port **34** to the intake line **32** past the temperature sensor **22** of the electrical heat switch **20** which is open to a thermo-reactive valve **24** such as a thermostatic expansion valve **26** that remains closed for as long as the oil **16** remains below a specified range thereby returning the oil **16** to the oil sump **14** via the by-pass conduit **40** and

by-pass valve **27** which is open and leading to the return line **36**. The oil **16** is returned to the oil sump **14** through the outlet port **38** where it is introduced to the engine's **12** standard oil lubrication circuit **44**. The oil pump **18** operates continuously during the operation of the engine **12** to provide for accurate and constant monitoring by the sensor **22** and the thermo-reactive valve **24** of the temperature of the oil **16** in the oil sump **14** being used to lubricate the engine **12** components. The first electrical wire **60** is connected to the positive terminal **72** of the battery **48** and is energized once the motor **12** is operating but current (indicated by arrows) is stopped at the electrical heat switch **20** which is open.

FIGURE 3 is a schematic view of the present invention **10.** Shown is the present invention **10** in use with an operating engine **12** during a high oil **16** temperature condition. The operation of the engine **12** mechanically drives the oil pump **18** during all phases of operation. The sensor **22** of the electrical heat switch **20** detects the high temperature condition and closes to complete the circuit between the power source **48** and the fan **46** to initiate the operation thereof. The by-pass valve **27** is simultaneously closed by the electrical current introduced thereto by the closing of the electrical heat switch **20** thereby prohibiting oil **16** through the by-pass conduit **40.** The thermostatic expansion

valve **26** opens due to the high temperature of the oil **16** and diverts it through the radiator **42** where the heat is transferred to the oil conduit **30** and drawn away by the heat sinks **43** and dispersed by the air flow created by the fan **46**. The cooled oil **16** is returned to the sump **14** through the return line **36** where it is then used by the standard lubrication circuit **44** to lubricate and cool the engine **12** components. The present invention **10** serves to maintain a reasonable operating temperature of the engine **12** even during extreme conditions and to prevent viscosity breakdown of the oil that occurs under such conditions. The oil filter **28** of the present invention **10** serves to remove any small solids which may have passed through the strainer element **52** upon entry. The strainer element **52**, oil filter **28** of the present invention **10** and conventional oil filter of the engine **12** serve to provide multi-tiered filtration of the oil **16**.

FIGURE 4 is a schematic view of the present invention **10** and engine **12** during a high temperature condition wherein the path of the oil **16** in the sump **14** that is cooled by the present invention **10** and used by the engine **12** through a standard oil lubrication circuit **44** for the lubrication and cooling of the engine **12** is shown. The path of a typical liquid coolant system **50** through the engine

12 is shown in hidden line. Please note that the present invention **10** used in conjunction with a standard oil lubrication circuit **44** and typical liquid coolant system **50** provides the engine **12** with a vastly greater degree of thermal control than the typical liquid coolant system alone **50** which only cools the cylinder head **54**. The oil-cooling radiator **42** has an oil fill port **56** with fill cap **57** and an oil drain **58** to provide flexibility when performing maintenance thereupon due to the difficulties that would be encountered due to the presence of the counter-backflow loop **37**.

FIGURE 5 is an electrical schematic of the present invention Depicted is the electrical path of the electrical heat switch **20**, the electric by-pass valve **27** and the fan **46** in relation to a DC power source **48**. Current is applied to the first electrical wire **60** from the positive terminal **72** as soon as the engine starts operating but travels no further upon reaching the electrical heat switch **20** which remains open until a high temperature condition is detected by the temperature sensor **22**. When the oil reaches a preset temperature, the temperature sensor **22** will close the electrical heat switch **20** to deliver current to the second electrical wire **62** and enable the cooling fan **46** and to the fourth electrical wire **66** to close the by-pass valve **27** with the fifth electrical wire **68**

connecting with the third electrical wire **64** leading back to the negative terminal **70**. When the oil temperature drops below the preset temperature, the electrical heat switch **20** opens in response to the temperature sensor **22** and disables the fan **46** and opens the by-pass valve **27**. The temperature sensor **22** may be variable thereby permitting the preset temperature for fan **46** and by-pass valve **27** activation to be adjusted accordingly but is preferably set to respond to a temperature equal to that required to fully open the thermo-reactive valve.

FIGURE 6 is a detail view of the radiator **42** of the present invention demonstrating the oil **16** flow through the conduit **30** passing therethrough. The conduit **30** of the return line **36** has a counter-backflow loop **37** with the peak portion thereof level with or higher than the highest point of said intake conduit **32** to prevent the oil **16** from draining back into the sump from the radiator **42** when the engine is turned off.

FIGURE 7 is a detail view of the oil pump **18**, the electrical heat switch **20** and its sensor **22**, the oil filter **28**, the open thermo-reactive valve **24** shown here as a thermo-static expansion valve **26** which is fully open and the closed by-pass valve **27** during a high oil **16** temperature condition.

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.